

DESIGN NOTES:

Specifications:

Design:
Bridge Design Specification (1983 AASHTO)
Specifications with revisions by Caltrans)
Load Factors: $1.5 D + 1.5 E + 2.5 (L + I)$
Where D=Dead Load
E=Earth Load
L=Live Load
I=Impact
Capacity reduction factor is included.

Loading:

Live load:
HS20-44 truck
Apply impact only to the roof slab.

Earth Cover	Impact (%)
Up to 1'	30
1.1' to 2'	20
2.1' to 3'	10
Over 3'	0

No surcharge on walls due to live load.
Earth load:
Earth pressures for two conditions:
140 LB/CF vertical, 42 LB/CF horizontal.
140 LB/CF vertical, 140 LB/CF horizontal.

Unit stresses:

$f_c = 3600$ psi
 $f_y = 60,000$ psi

Distribution "d" bars:

Up to and including 10'-0" cover
Expressed as a percent of main positive reinforcement required: 100, Max 50%.

Over 10'-0" cover
#4 @ 18 maximum.

Shear:
Maximum allowable shear, $v_c = 3.5\sqrt{f_c}$, psi

Exclusions:
Compressive reinforcement and negative-moment reduction (for continuity) do not apply.
Axial loading on members has not been considered.

CONSTRUCTION NOTES:

Construction loads:

Strutting required as shown on Standard Plan D88.
Strutting may be required on culvert extensions when existing parapet is removed.

Expansion joints:

Invert:
No expansion joints shall be permitted.

Roof and Walls:

When cover is less than span length-
Place 1/2" preformed expansion joint filler at 30'-0" ± centers outside the paved roadway lanes and place Bridge Detail 3-2, Standard Plan B0-3, at 30'-0" centers under paved roadway lanes.
When cover is more than span length-
Place 1/2" preformed expansion joint filler at 30'-0" ± centers and additional 1/2" preformed expansion joints at locations of change in foundation character, as directed by the Engineer.

Construction joints:

Temporary joints may be permitted if normal (or radial) to ϕ of RCB. Otherwise, the contractor is to submit a proposal for consideration.

Cutoff walls:

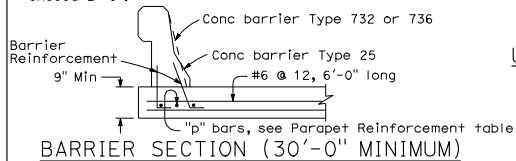
4'-0" cutoff walls are to be provided at inlet and/or outlet unless adjacent channel is lined and unless otherwise shown. These walls are to be extended if scour conditions warrant.

Earthwork:

See Standard Plan A62E.

Backfill:

See Standard Specifications, except that the difference in level of backfill (against outside walls) shall not exceed 2'-0".



GENERAL NOTES:

Designation:

Standard single or multiple box culverts are shown on plans as span times height with maximum cover over roof thus: 8' x 5' RCB with 10' or DBL 10' x 5' RCB with 20', followed by alternatives.

Alternatives:

Single cell: Invert will be sloped unless "trapezoidal invert", "flat invert" or "V invert" is included in designation.

Multiple cell: Invert will be vee unless "flat invert" is specified. Ends of culvert will be rounded unless "square ends" are designated. Parapets will be as shown unless designated in plans. Such designations may be different for inlet and outlet ends.

Quantities:

Quantities are for the sloped or vee invert and do not include 'd' bars, nor splices in longitudinal bars, nor temperature reinforcement for exposed roof, nor concrete or reinforcement for parapets, cutoff walls or paving notches.

Reinforcement placement:

Main reinforcement is to be placed transverse or, for curved culverts, radial. When radial, reinforcing spacing of the "a", "f" and "g" bars is measured along the centerline. Stagger splices not shown. Hooks may be rotated or fillet, as necessary, for clearance. Special reinforcement coverage:

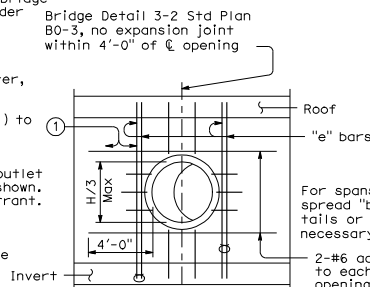
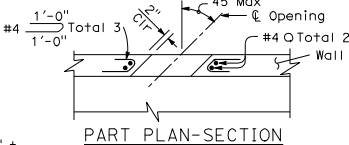
Box standard plans are not to be used for culverts in a corrosive environment or where there is a severe abrasive flow condition or in freeze-thaw locations.

Special design:

Required for culverts with conditions, loads, design bearing pressures or sizes greater than those given in this plan or Standard Plans D80 & D81. Also required for multiple cell culverts with unequal spans. For culverts with railroad loading, see the current AREA design specification.

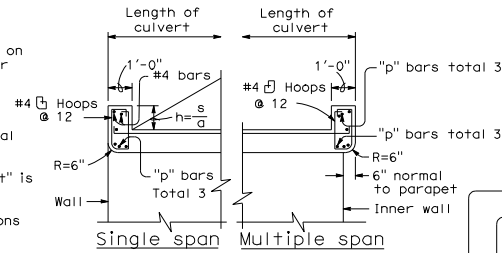
3 or more cells:

For culverts with more than two cells, use dimensions and reinforcement for the standard "double box culvert" and adjust quantities accordingly.



LONGITUDINAL SECTION
UTILITY OPENING-WALL
H=Height of box

① Adjacent to each side of the opening, place additional bars equivalent to half the interrupted main reinforcement.



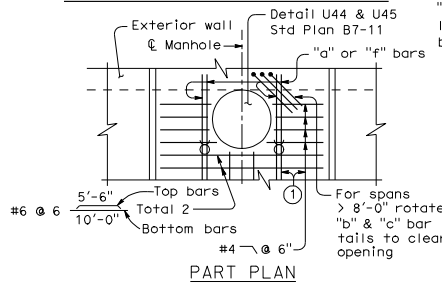
PARAPET DETAIL
s = Clear span (ft)
a = 12 cosine skew angle

Span	Parapet "p" bars			
	Skew Angle	16°	31°	45°
4'	10°	10°	10°	10°
6'	15°	15°	15°	15°
8'	#4	#4	#4	#4
10'	#4	#4	#5	#6
12'	#4	#5	#6	#7
14'	#6	#7	#8	#9

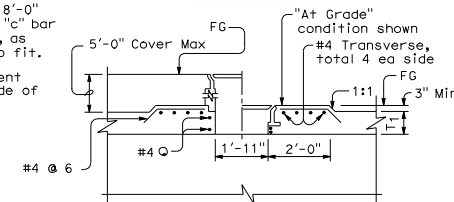
PARAPET REINFORCEMENT

Height	Cover	
	10'	20'
6'	2.0 ksf	3.2 ksf
8'	2.2 ksf	3.4 ksf
10'	2.4 ksf	3.6 ksf
12'	2.6 ksf	3.8 ksf
14'	2.8 ksf	4.0 ksf

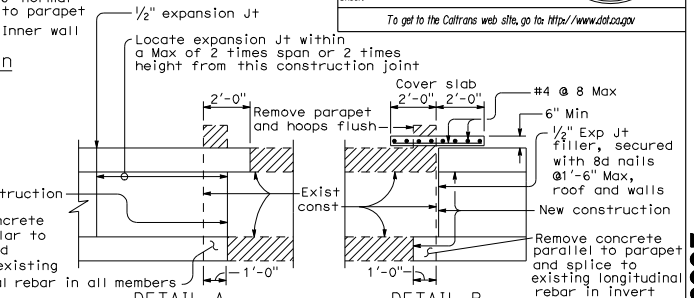
DESIGN BEARING PRESSURE



PART PLAN

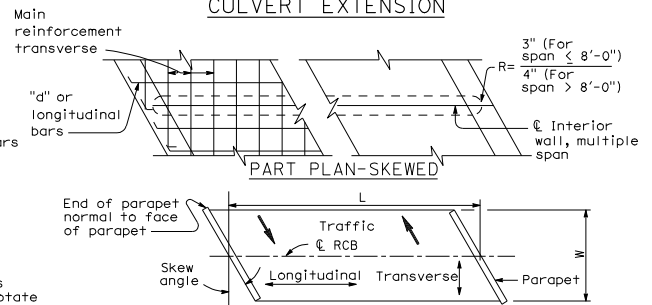


PART LONGITUDINAL SECTION
MANHOLE



(20° maximum skew as shown. If existing longitudinal and transverse reinforcing bars in top slab are lap spliced with new longitudinal and transverse reinforcing bars, the 20° skew may be exceeded. Lap splicing may require removal of top slab in excess of 2'-0" shown.)

CULVERT EXTENSION



RCB TERMINOLOGY

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
**CAST-IN-PLACE REINFORCED
CONCRETE BOX CULVERT
MISCELLANEOUS DETAILS**

NO SCALE

D82